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OBSERVATIONS IN THE PLAGUE DISTRICTS IN INDIA.

In the New York Medical Journal for February 3, 1900, page 145, Barker and Flint, of the Johns Hopkins University of Baltimore, publish an interesting statement of their visit and observations in the plague districts in India. After noting the steady spread of the disease since 1893, and noting the outbreaks which have occurred west of Suez, they say:

In the old foci in Hongkong and India the disease is still endemic, and from the former of these points came the infection of the cases recently reported into Manila and Honolulu. Conditions exist among the natives and Chinese of these two American colonies that favor the spread of the plague, and only the most stringent measures on the part of the American sanitary officers can prevent the outbreak of serious epidemics and the repetition of scenes not unlike those seen in Poona.

Clinical.

The ordinary clinical and pathological features of the disease are now well known; it constitutes a symptom-complex, notably in the bubonic form, that affords little difficulty of diagnosis. The appearance of fever, associated with painful glandular enlargements in the groin, axilla, neck or region of the epitrochlear gland, after a period of incubation lasting variously from three to nine days, with severe headache, nausea and vomiting at the outset, roughly indicates the cardinal symptoms of typical bubonic plague. The fever varies between 103° and 105° F., but often rises as high as 108° F. During convalescence the fever falls by lysis usually, by crisis rarely.

As in many other acute infectious diseases, there is a leucocytosis varying between 12,000 and 28,000 and a synchronous oligochromemia, the haemoglobin varying between 65 and 80 per cent of normal. Some of the buboes suppurate, others resolve, but all are painful; in fact so severe is the pain that continuous application of the ice bag is often necessary for its relief. The course of the disease is variable; in fatal cases it may terminate in forty-eight hours after the onset, or as often happens five or six days intervene before the death of the patient. The death rate varies with the race and sanitary surroundings of the sufferer. Cases with suppurating buboes often drag along for months before the pyæmia ceases, but fortunately after the first few days the pus in such cases is usually sterile.

In certain of the obscurer forms of plague, viz, the pneumonic, tonsillar, and hemorrhagic types, as they are classified in Bombay, the disease simulates more or less closely other conditions, and the problem of diagnosis is accordingly rendered more complex. Microscopic examination of the sputum and cultures from the blood in pneumonic cases lead to a diagnosis; the plague bacilli are found in great quantities in the sputum in true plague pneumonia. The observer should bear in mind, however, that occasionally double infections are to be expected of the pneumococcus associated with the B. pestis. In those cases in which the tonsils or postlingual adenoids form the portal of entry, buboes in the deep cervical chain of lymphatic glands usually develop. Moreover, hemorrhages into the serous surfaces of the stomach and intestines, associated with the buboes in the mesenteric glands occur in the hemorrhagic type. In these cases it is supposed that the infection takes place through the alimentary tract. One should remember, however, that in all cases of plague there is a general tendency to hemorrhage, and that among the commonest necropsy findings are cutaneous petechiæ, and hemorrhagic extravasations into the mucous membrane of the stomach, the great serous membranes, and the serosa of the great veins.

Clinically, it is sometimes difficult to distinguish the plague from early malaria or relapsing fever, but the microscope can be relied upon to show either the malarial parasite in the one, or Obermeier's spirillum in the other, and so at once a positive and satisfactory diagnosis can be made. But in the East, especially in large epidemics where the cases are many and the trained assistants are few, the aids of clinical microscopy can rarely be obtained. At the Arthur Road Hospital, in Bombay, we have seen cases of combined infection—malaria with plague, and plague with relapsing fever. It is said that the infection combined with malaria is not so fatal as plague alone, an observation which gains interest when it is recalled that the Italians assert that the presence of bacteria other than the plague bacilli attenuates the virulence of the most virulent plague bacilli. Another rare form of the disease which we saw with Khan Bahadur Dr. Choksey, in Bombay, is that associated with a unilateral or bilateral parotiditis, the portal of entry in these cases being probably through Stenson's duct. Enlargements of the cervical chain of lymph glands usually accompany these infections of the parotid.

Prevention of spread.

Plague is a disease which not only affects rats but is spread by them. Accordingly measures should be taken to quarantine them or to encompass their death speedily.

Cases should be removed to hospitals ventilated and lighted to the maximum as the absolute essentials, whatever other conveniences they may have, for the experience of the East yields this conclusion: The organism does not seem to be able to develop virulently where there are free currents of air, and hence it passes by and little affects well ventilated buildings.

All those who have been exposed to infection or have been in contact with cases are known as "contacts," and should be kept for a certain period in segregation camps where daily inspections can be held until the period of incubation is over. All infected dwellings should be disinfected and lime washed.

The proper disposal of the dead and the disinfection of effects are, of course, to be looked out for as in an epidemic of any infectious disease. A house-to-house inspection for new cases in places where there are none reported is wise if it is tolerated, but in the Orient this has been one of the most fertile means of causing the concealment of cases, and concealment is regarded as probably the most effective means of spreading the disease.

The Haffkine prophylactic.

As a preventive measure against plague, Haffkine, an investigator formerly of the Pasteur Institute, but now in the service of the Indian Government, has, as is well known, prepared a prophylactic consisting of dead cultures of the bacillus pestis, injections of which are said to confer a considerable degree of immunity against the disease. * * * Haffkine's experiments indicate that the precipitate of dead bacteria without the clear fluid injected into animals excites a marked local reaction with only slight constitutional phenomena, while injection of the clear fluid without the dead bacilli causes marked general phenomena, with slight local reaction. The whole sterilized culture is used as the vaccine against the plague.

The bottles are shipped from the laboratory all over India, and also, to other parts of the world. Haffkine advises about two cubic centimeters of the prophylactic at a dose, but at Hubli, where it has been used most, the dosage was somewhat larger, but was varied with the personal equation of the patient and the virulence of the dead culture. The reaction consists in an elevation of temperature, headache, and a feeling of general malaise, but this is only transitory and soon disappears. According to Colonel Weir, who was himself inoculated, the local reaction is not as violent as it is generally believed to be, for associated with the slight tumefaction there is a pain only about as severe as that resulting from slight bruises. In patients twice inoculated an agglutination reaction to virulent cultures of the organism is always obtainable with the serum of the individual. The duration of the immunity thus conferred is at present unknown, and naturally could only be determined by analogy from the persistence of the Widal test, or from the accumulation of a mass of statistical evidence bearing on this point.

The advantage of the double or single inoculations in heightening the degree of the immunity is shown in the following significant figures from the report of E. L. Cappel to the plague commissioner: Of 4,296 single inoculations, 45 persons contracted the disease, with 15 fatalities; of 3,387 double inoculations, 2 persons contracted the disease, with 1 fatality.

Even more significant is the fact that among the noninoculated at this period of the epidemic 657 persons to the thousand died in a single week, although the inoculated were exposed to the same general conditions and environment. Mr. Cappel's own words on this point sound almost incredible: "If this experiment had failed, the results, judged by the actual mortality among the noninoculated would have been appalling. All sanitary measures in the shape of disinfection, unroofing of houses, and segregation were applied concurrently with inoculation, as the Government is already aware; but the rate of mortality among those who held back from the inoculation rose at one time to a height which I believe has never been approached elsewhere—standing in the third week in September at the figure of 657 per thousand per week."

Statistical results of the Haffkine inoculations.

Perhaps the results of this gigantic experiment can best be presented by the following table, which we have excerpted from Surgeon-Captain Leumann's report. The conclusions to be drawn from it are self-evident.

Dates.	Census of Hubli.	Inhabitants.		Plague deaths among—	
		Noninoculated.	Inoculated.	Noninoculated.	Inoculated.
	Fell from 50,000 *to—*	*Number.*	*Number.*	*Number.*	*Number.*
Five weeks from May 11 to June 14	47,427	44,573	2,854	47	1
June 21	47,082	41,494	5,588	22	3
June 28	47,485	39,042	8,443	29	1
July 5	46,537	36,020	10,517	55	6
July 12	46,518	33,255	13,263	34	6
July 19	45,240	29,716	15,524	82	7
July 26	43,809	24,112	19,697	100	15
August 2	43,707	21,031	22,676	140	16
August 9	42,768	15,584	27,184	272	19
August 16	40,441	10,685	29,756	386	61
August 23	39,400	6,367	33,033	371	41
August 30	38,210	4,094	34,116	328	28
September 6	38,382	2,731	35,469	227	34
September 13	38,408	1,116	37,292	138	47
September 20	39,142	937	38,205	106	55
September 27	39,315	603	38,712	58	20

Serum treatment.

Another form of treatment used in Bombay hospitals is the "Heil-serum" also prepared under the patronage of the Government at the Parel Government House, by the assistants of Professor Lustig, whose name it bears. The serum has not been extensively employed in India because of its scarcity, and also on account of the prejudices of the natives. It has, however, been used in some 500 cases, with 60 per cent recoveries and 40 per cent mortality, while the death rate in untreated natives may run as high as 80 per cent. Those who are engaged in making the serum maintain that much better results than those indicated in the above percentage can be obtained by increasing the number of healing units in the serum. In one of his articles Lustig states that he succeeded in curing completely 26 out of 30 cases of plague with his serum.

The serum of Yersin, somewhat similar to that of Lustig, has been used in India, but the results obtained by its use were not satisfactory, although it must be acknowledged that the number of cases upon which it was judged was ridiculously small. It may be worthy of note that Yersin's serum possesses agglutination power toward virulent cultures of the plague bacillus.

Conditions in India.

The sanitary regulations enforced in India depend on the amount of innovation and degree of control that the conservative natives will tolerate. Briefly, the points observed are, (1) isolation of the infected area; (2) immediate report of cases and instant removal to hospitals; (3) segregation of "contacts;" (4) death of rats; (5) disinfection of premises and effects that have been exposed to the disease; (6) prevention of overcrowding and general sanitary improvement of the infected area.

Twice before Poona has been ravaged by the plague, and each succeeding epidemic, unfortunately, has been worse than the preceding. In February of the present year (1899), the chief plague authority stated that the disease had been stamped out of the city. In March and April the death rate considerably increased; and in July the disease appeared in its worst form, carrying off from 150 to 160 people a day. Normally, the city has a population of 140,000, but in five months it has dwindled to 60,000. But as the population went down the mortality went up, and even at the time of our visit still persisted at the rate of 150 deaths a day. Such a rate of mortality in New York would mean about 10,000 deaths per day, 70,000 per week. Even in Poona enough people die in a month to populate a prosperous American city.

During August there was an average of 100 hospital admissions per day, and over 80 deaths.

The trip to Poona was a rare experience in the horrible. Even to those inured to scenes of suffering and accustomed to the presence of the dead, it left the impression of a dreadful nightmare that weeks of residence in one of God's own countries have not yet removed. The terms *plague stricken*, *pest ridden*, and *pestilence* can only have their full meaning to those who have actually witnessed such scenes, and when we left them it was with a sense of profound gratitude that after all the West was not the East.

Transfer of Mariel quarantine to the Marine-Hospital Service confirmed.

WASHINGTON, D. C., *January 27, 1900.*

SIR: Referring to your letter of December 27 last in which you request that an order be issued confirming to the United States Marine-Hospital Service the possession of the quarantine station at Mariel, Cuba, which was turned over to the United States Marine-Hospital Service by an order of the military governor of Cuba, dated November 14, 1899, and since which time the station in question has been virtually in charge of that Service, I have the honor to inform you that the military governor of Cuba having reported that there is no objection to placing the lazaretto, or quarantine station, at Mariel, in charge of the United States Marine-Hospital Service during the military occupation of Cuba by the United States, its transfer to your Department for the use of the United States Marine-Hospital Service is hereby confirmed and the military governor of Cuba has been so advised.

Respectfully,

ELIHU ROOT,
Secretary of War.

HON. SECRETARY OF THE TREASURY.